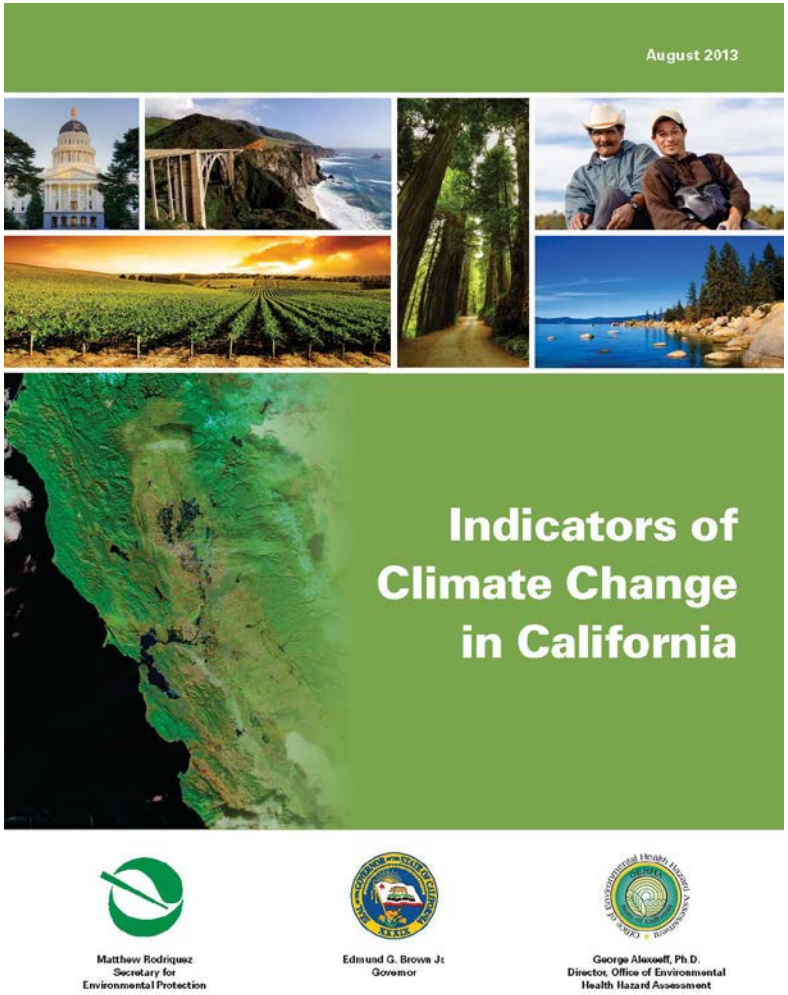
Caltrans Activities Related to Climate Change

Planning Horizons
August 28, 2013

Garth Hopkins, Chief
Office of Regional and Interagency Planning
HQ Division of Transportation Planning

California's Changing Climate



- The state's high, low and average temperatures are all rising

- Lake Tahoe's surface temperature was the highest ever recorded in 2012

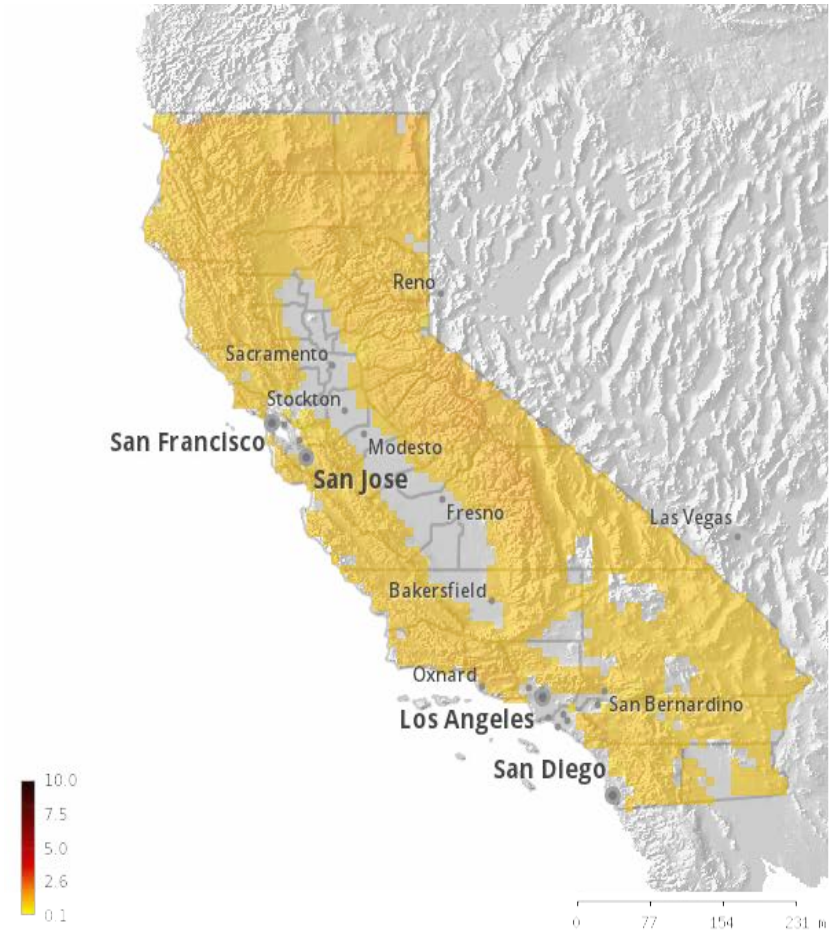
- Annual average acres burned in CA wildfires between 2000 – 2012 is more than double the average burned between 1950 - 2000

- Sea levels have risen by an average of 7 inches in CA over the past century

- Earlier and decreased runoff will reduce water supplies

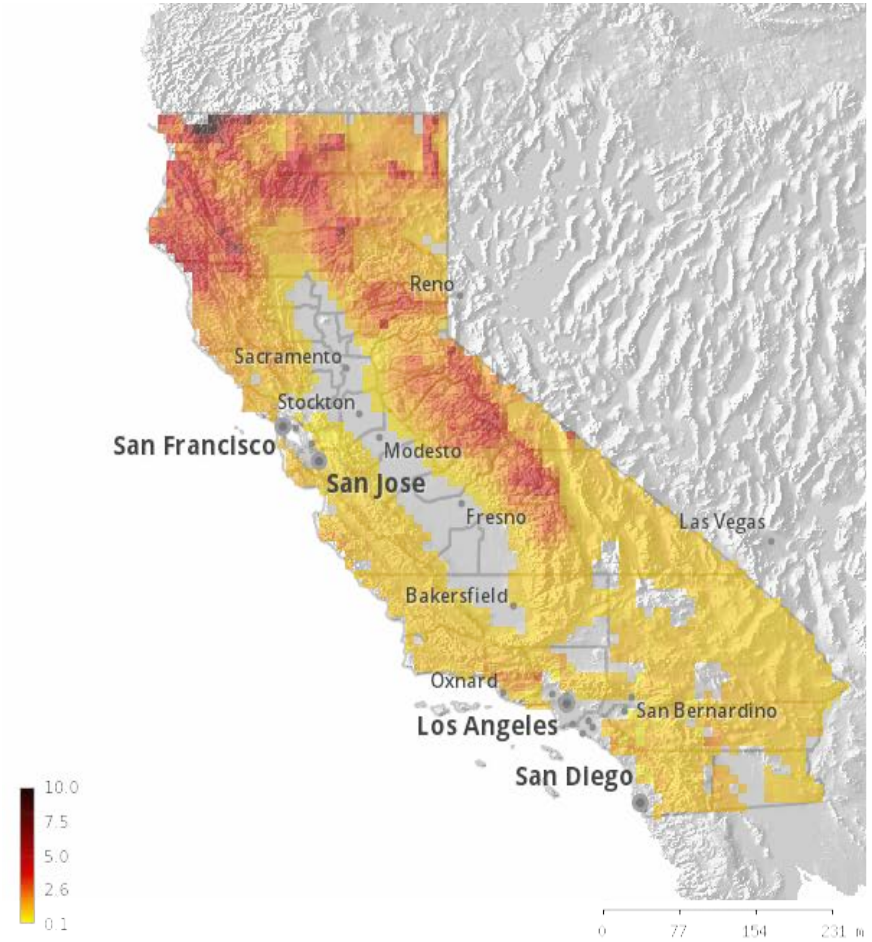
Cal-Adapt Forest Fire Projection Maps

2020



MODEL: CNRM- Coupled Global Climate Model Version 3
DATA: Change In Fire Risk
SCENARIO: Special Report on Emissions Scenarios A2

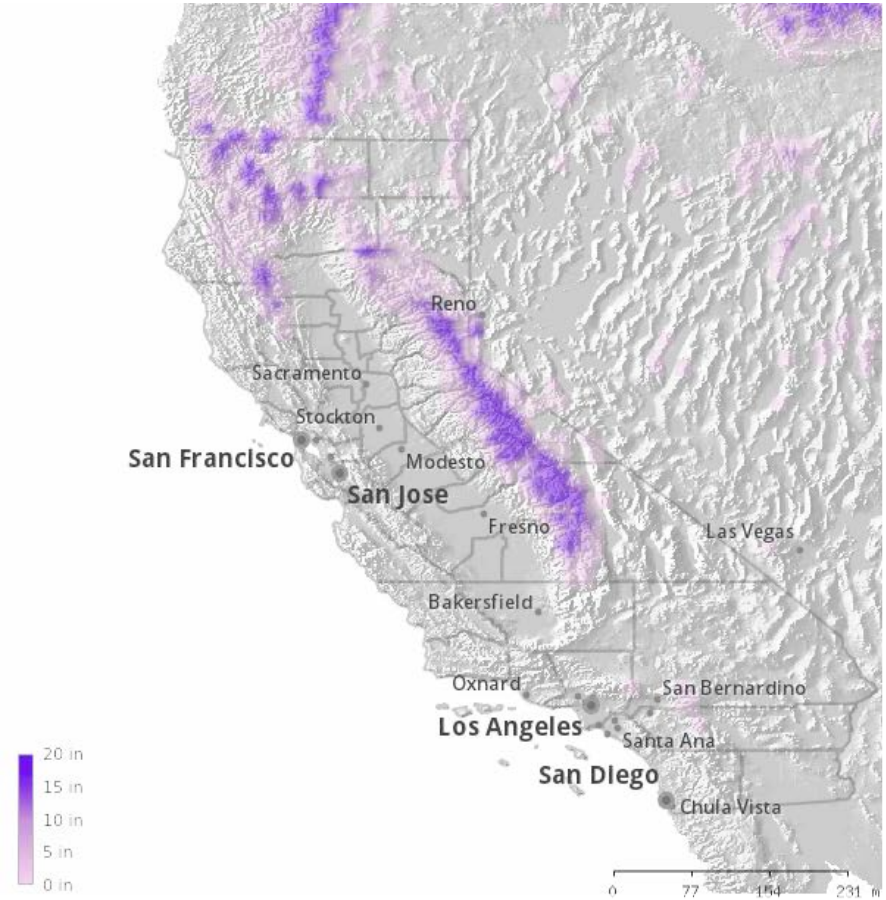
2058



MODEL: CNRM- Coupled Global Climate Model Version 3
DATA: Change In Fire Risk
SCENARIO: Special Report on Emissions Scenarios A2

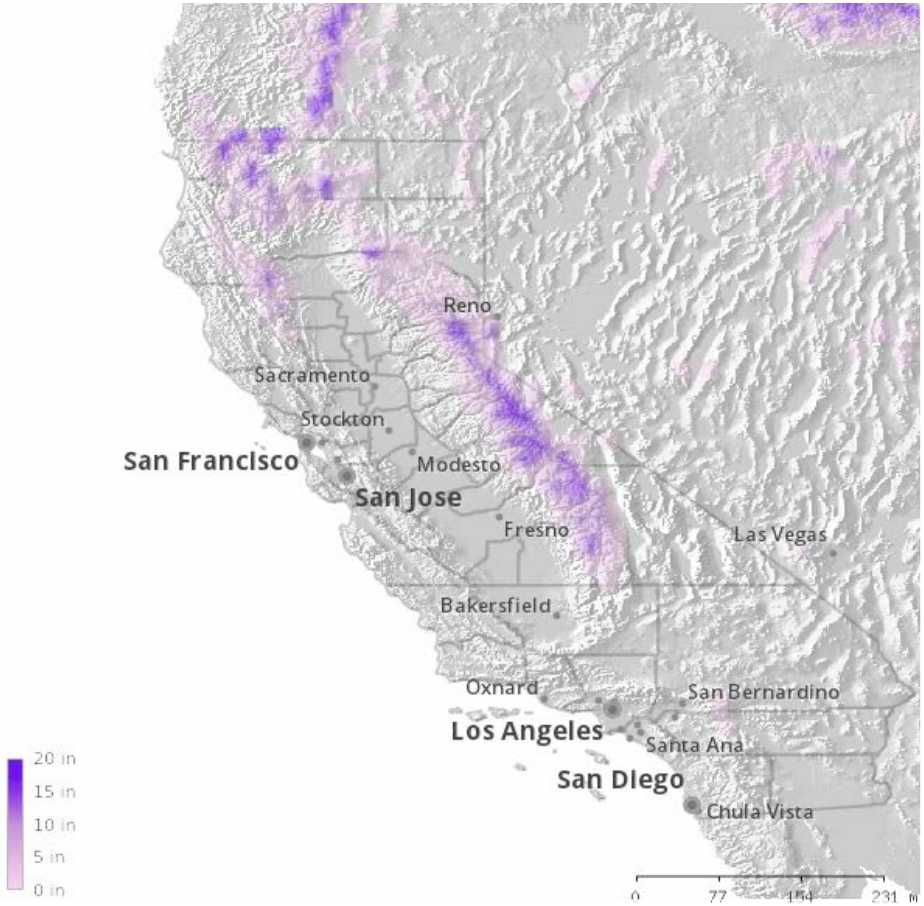
Cal-Adapt Snowpack Projection Maps

2020



MODEL: ALL- Average of GFDL, CCSM3, CNRM, and PCM1
DATA: Projected April Snow Water Equivalent from 2000 to 2010
SCENARIO: Special Report on Emissions Scenarios A2

2050



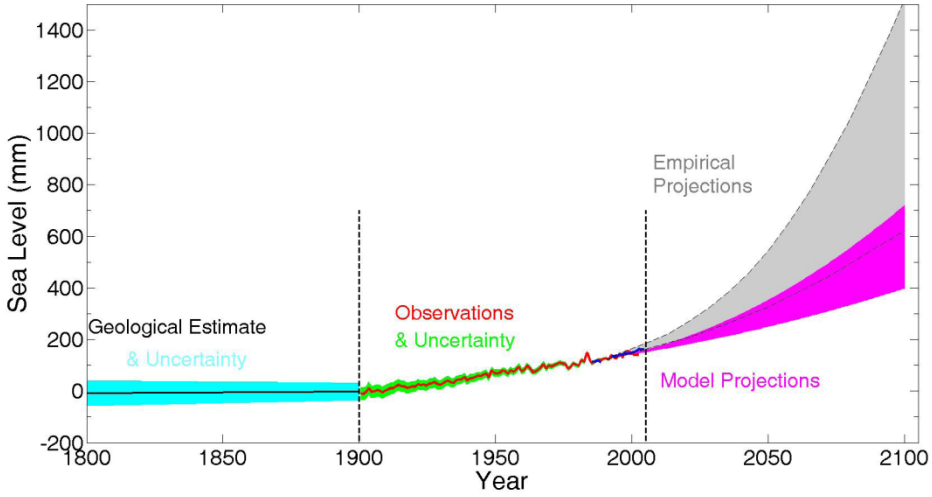
MODEL: ALL- Average of GFDL, CCSM3, CNRM, and PCM1
DATA: Projected April Snow Water Equivalent from 2050 to 2060
SCENARIO: Special Report on Emissions Scenarios A2

Sea Level Rise

Climate Impact	Potential Transportation Impact
Sea Level Rise	• Roadway washout • Flooding of roadways • Disruption of transit services • Bridge Scour • Railway flooding • Damage to roadway substructure • Route closure • Travel Delays • Increased need for emergency response services

Estimated, observed and projected sea level rise for 1800 – 2100

National Academies of Sciences "Sea Level Rise for the coasts of California, Oregon and Washington " 2012



Rising sea levels threaten low lying transportation infrastructure

Storm surge flooding the roadway
District 1

Changing Precipitation Patterns

Climate Impact	Potential Transportation Impact
Increase in intense precipitation events	• Flooding of roads and railways • Landslides • Road washouts • Route closures • Travel delays • Increased need for emergency response services • Bridge scour

Lane closure on I-505 due to flooding

Landslide after a heavy rainfall

Flood and landslide on I-80

Increased Temperatures

Climate Impact	Potential Transportation Impact
Higher Temperatures	• Highway asphalt rutting • Highway asphalt buckling • Concrete deterioration • Route closures • Travel delays • Limits on periods of construction activity • Rail buckling • Increased thermal expansion of bridges • Changes to biodiversity/vegetation • Increase in wildfires and mudslides

Roadway Pavement Buckle

Railroad sun kink

Higher temperatures and extreme heat events will necessitate more night time work

Wildfires

Crews replacing burned guardrails on US 50

SR 13 and SR 24 serving as emergency response staging area during a local wildfire

Adaptation vs. Mitigation

Adaptation - An adjustment to transportation infrastructure in response to actual or expected climate effects

Retaining wall to prevent flood debris from entering SR 1

Strengthening hillside after a slide on SR 1

Adaptation vs. Mitigation

Mitigation – Reducing greenhouse gas emissions

District 10 maintenance yard parking structure with solar panels

Road paving using rubberized asphalt (recycled tires)

A Caltrans vehicle being filled with E85 flex fuel

Climate Change Legislation and Executive Orders

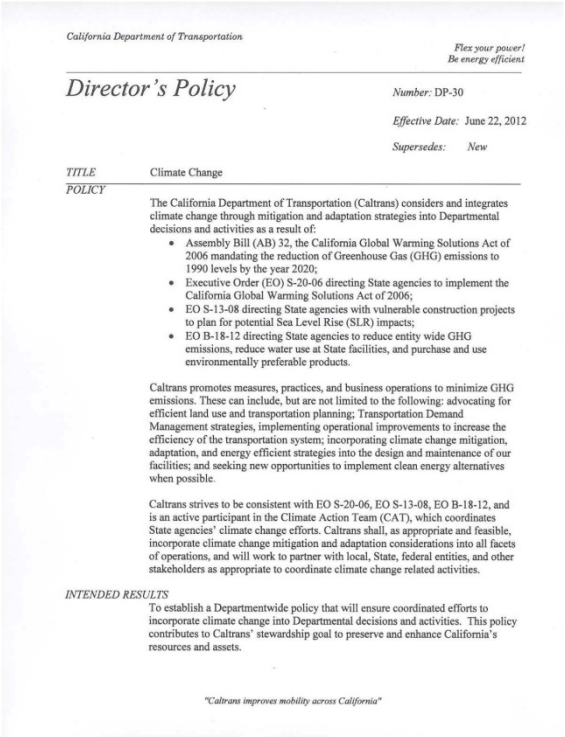
- AB 32 – The Global Warming Solutions Act of 2006
  - Reduce statewide GHG emissions to 1990 levels by 2020
  - Cap and trade
  - Low Carbon Fuel Standard
- SB 375 – Sustainable Communities and Climate Protection Act of 2008
  - Established regional greenhouse gas emission reduction targets for Metropolitan Planning Organizations
- Executive Order S-13-08 (2008)
  - State Agencies planning construction projects in areas vulnerable to sea level rise must consider sea level rise projections for the years 2050 and 2100
- Executive Order B-18-12 (2012)
  - State Agencies must reduce operational greenhouse gas emissions and energy usage
  - New and existing state-owned buildings must achieve net zero energy consumption targets
  - State Agencies must reduce water use

Caltrans Climate Change Directors Policy

- Director's Policy 30 (June 2012) establishes a Department wide policy to incorporate climate change into Departmental decisions and activities

- When appropriate and feasible ensures climate change adaptation and mitigation is incorporated into all facets of Caltrans operations

- Includes tasks for
  - Director
  - Chief Deputy Director
  - Planning and Modal Programs
  - Maintenance and Operations
  - Project Delivery
  - Administration
  - District Directors



California Department of Transportation

Flex your power!
Be energy efficient

Director's Policy

Number: DP-30

Effective Date: June 22, 2012

Supersedes: New

TITLE Climate Change

POLICY

The California Department of Transportation (Caltrans) considers and integrates climate change through mitigation and adaptation strategies into Departmental decisions and activities as a result of:

- Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006 mandating the reduction of Greenhouse Gas (GHG) emissions to 1990 levels by the year 2020;
- Executive Order (EO) S-20-06 directing State agencies to implement the California Global Warming Solutions Act of 2006;
- EO S-13-08 directing State agencies with vulnerable construction projects to plan for potential Sea Level Rise (SLR) impacts;
- EO B-18-12 directing State agencies to reduce entity wide GHG emissions, reduce water use at State facilities, and purchase and use environmentally preferable products.

Caltrans promotes measures, practices, and business operations to minimize GHG emissions. These can include, but are not limited to the following: advocating for efficient land use and transportation planning; Transportation Demand Management strategies, implementing operational improvements to increase the efficiency of the transportation system; incorporating climate change mitigation, adaptation, and energy efficient strategies into the design and maintenance of our facilities; and seeking new opportunities to implement clean energy alternatives when possible.

Caltrans strives to be consistent with EO S-20-06, EO S-13-08, EO B-18-12, and is an active participant in the Climate Action Team (CAT), which coordinates State agencies' climate change efforts. Caltrans shall, as appropriate and feasible, incorporate climate change mitigation and adaptation considerations into all facets of operations, and will work to partner with local, State, federal entities, and other stakeholders as appropriate to coordinate climate change related activities.

INTENDED RESULTS

To establish a Departmentwide policy that will ensure coordinated efforts to incorporate climate change into Departmental decisions and activities. This policy contributes to Caltrans' stewardship goal to preserve and enhance California's resources and assets.

"Caltrans improves mobility across California"

Caltrans' Participation in Climate Change Efforts

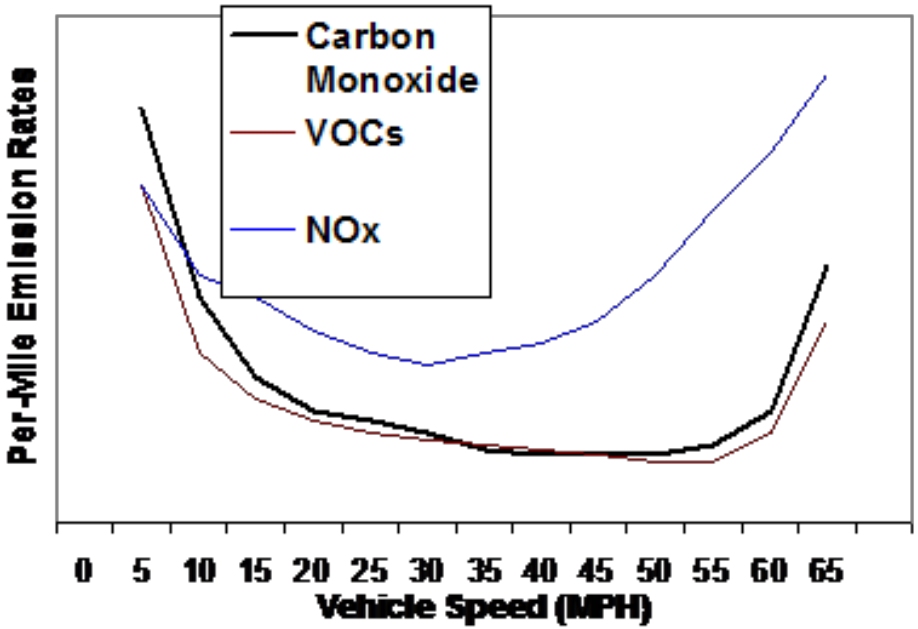
- Ca State Government
  - Climate Action Team (CAT) and subgroups: Coastal and Oceans, research, communications, SB375, State Operations
  - Climate Registry
  - Heat adaptation workgroup
  - Adaptation strategies workgroup

- National Organizations
  - American Association of State Highway and Transportation Officials

- Local/Regional efforts
  - Caltrans works with local and regional agencies statewide on a range of climate change issues

State Highway System Operational Efficiencies

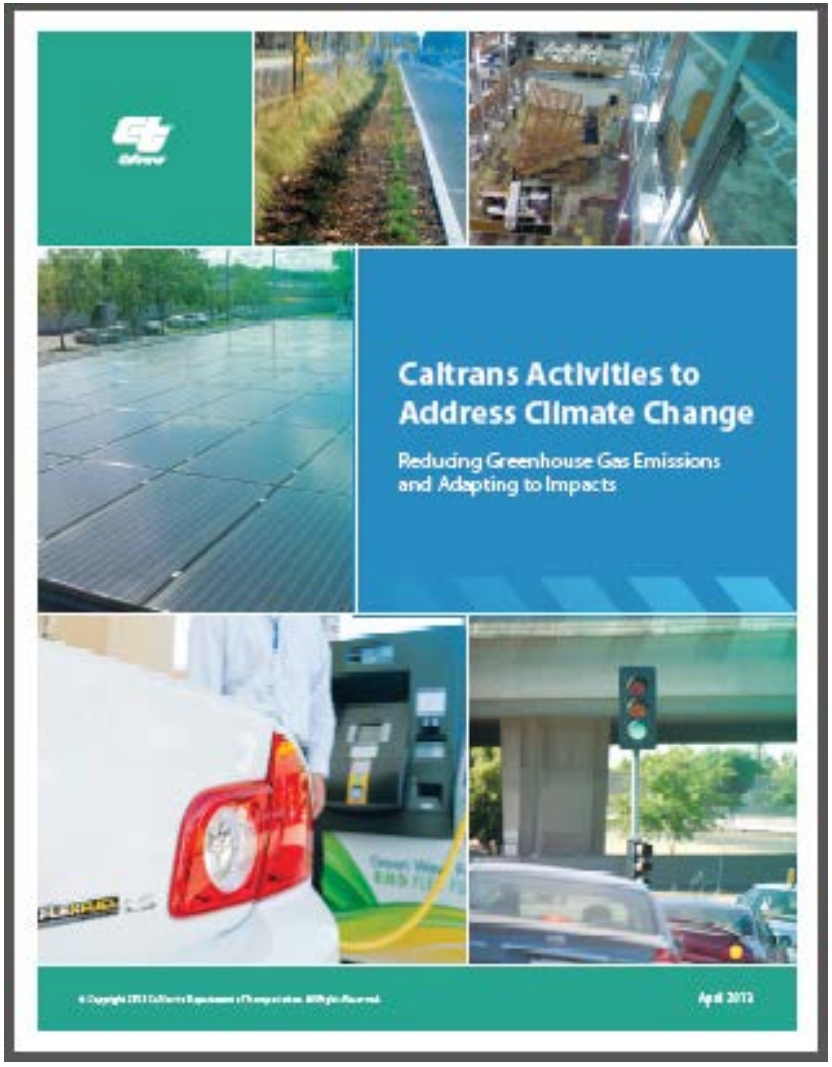
- Each hour of vehicle delay wastes 1.7 gallons of gas, and releases over 13,000 grams of CO2
- In 2011, there was over 86 million annual vehicle hours of delay on urban freeways in California
- The Division of Traffic Operations seeks to optimize transportation systems throughput thus reducing GHG emissions
- Caltrans owns and operates
  - Over 2,000 ramp meters
  - Over 35,000 ramp and vehicle detectors
  - Over 2,000 video cameras
  - Over 750 changeable message signs



Caltrans' Emissions Overview

Types of Emissions	2009	2010	2011
Caltrans Fleet (Approximately 12,000 pieces of equipment)	87,820 metric tons	83,696	82,729
Electricity for street lights and office buildings	131,227	88,774	95,040

Caltrans Activities to Address Climate Change



- Inventory of all mitigation efforts underway and planned throughout Caltrans

http://www.dot.ca.gov/hq/tpp/offices/orip/climate_change

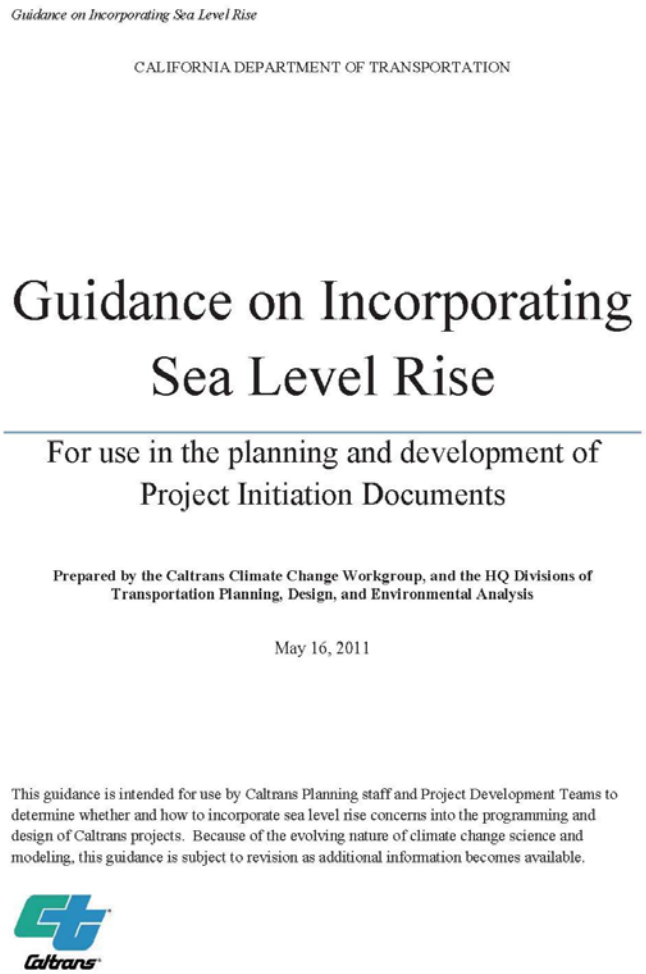
Caltrans Activities to Address Climate Change

Strategy	Average annual GHG reductions
Alternatives to conventional concrete	47,236
Alternatives to conventional asphalt	61,475
Total – materials, concrete and pavement strategies	**108,711**
Roadway lighting	38,819
Alternative fuels and vehicles	2,182
Total – operations and maintenance strategies	**41,001**
Renewable energy projects	1,391
Building energy and water efficiency	3,511
Workplace commute programs	6,465
Total – facilities and administration strategies	**11,367**
TOTAL	**161,079**

- This table summarizes the GHG reductions throughout Caltrans in 2011

- The greenhouse gas reductions are equivalent to removing 31,000 passenger vehicles from the state highway system for a year

Caltrans Activities to Address Climate Change



Guidance on Incorporating Sea Level Rise

CALIFORNIA DEPARTMENT OF TRANSPORTATION

Guidance on Incorporating Sea Level Rise

For use in the planning and development of Project Initiation Documents

Prepared by the Caltrans Climate Change Workgroup, and the HQ Divisions of Transportation Planning, Design, and Environmental Analysis

May 16, 2011

This guidance is intended for use by Caltrans Planning staff and Project Development Teams to determine whether and how to incorporate sea level rise concerns into the programming and design of Caltrans projects. Because of the evolving nature of climate change science and modeling, this guidance is subject to revision as additional information becomes available.

Caltrans

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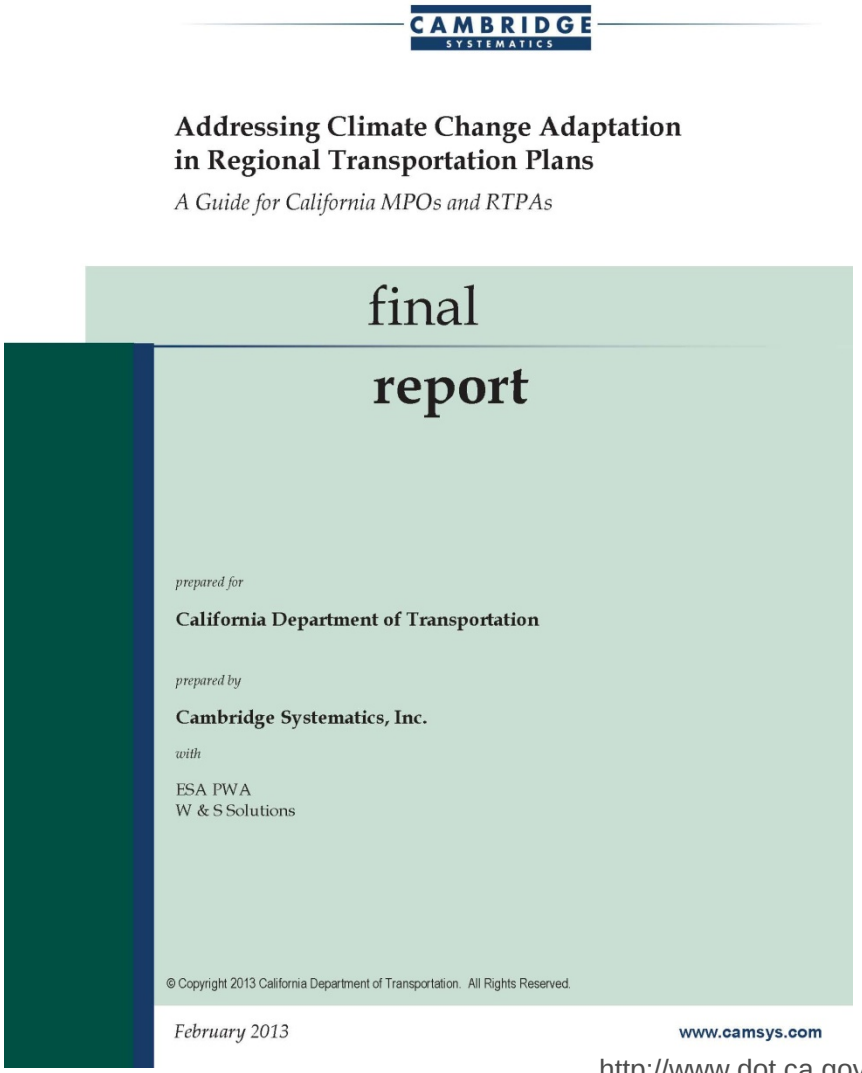
http://www.dot.ca.gov/hq/tpp/offices/orip/climate_change

Caltrans Activities to Address Climate Change



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Upcoming Project to Address Climate Change

- District Climate Change Vulnerability Assessments
  - Assessment of assets vulnerable to impacts from climate change
  - Will allow each District to identify and prioritize mitigation efforts
  - A map showing vulnerable segments of the state highway system and a report of the findings will be prepared for each District

Thank You

- Climate Change Branch
  www.dot.ca.gov/hq/tpp/offices/orip/climate_change/index.shtml
- Cal-Adapt
  www.cal-adapt-org
- California Climate Change Portal
  http://www.climatechange.ca.gov/